

CA 18. (Twice Amended) A method according to claim 17 wherein said step of combination further comprises the step of [reducing said added output signal by one-half its] inputting a signal having an input amplitude and outputting the signal at one-half the input amplitude.

REMARKS

Claims 1 to 18 and 20 to 29 are pending in the application, with claims 1, 4, 7, 11 and 14 being the independent claims. Reconsideration and further examination are respectfully requested.

Objection was made to the specification for failing to provide proper antecedent basis for the subject matter claimed in claims 3, 8, 13 and 18. It is noted that those claims have been amended above to more clearly define Applicant's invention. In view of those amendments and page 8, lines 4 to 10, of the specification, withdrawal of this objection is respectfully requested.

Objection was also made to claim 11. In response, Applicant has amended claim 11 to delete the second "to" at line 3. Accordingly, withdrawal of this objection is also respectfully requested.

Claims 1 to 18 and 20 to 29 were rejected under 35 U.S.C. § 112, second paragraph. In particular, it was asserted that the recitation of "signal" and "function" in

claims 1, 4 and 13 was unclear. For the following reasons, Applicant fails to understand the grounds for this rejection. In claim 1, line 6, "a signal" is followed by "at said second input." Thus, it is believed to be quite clear what signal is intended. The fact that "signal" is used elsewhere in the claim does not make the use of the term "a signal" in line 6 unclear. In fact, by intentionally using the indefinite article "a" before "signal", Applicant intends that the signal at the second input can be any signal, whether the same or different from the signal at the first input. Similarly, by reciting "a function" in line 6, Applicant intends that the claim be broad enough to encompass any function performed by the second circuit, whether the same or different from the function performed by the first circuit. The claim language used is thus believed to be fully in accordance with PTO practice. Similar remarks hold true for claims 4 and 13. Accordingly, withdrawal of this rejection is respectfully requested.

Regarding the § 112, second paragraph, rejection of claims 3, 13 and 18, Applicant has amended those claims above to more clearly define Applicant's invention. The above amendments are believed to clearly provide antecedent basis for all terms used. Accordingly, withdrawal of this rejection is also respectfully requested.

It is noted that the amendments above have been made solely to overcome the Examiner's objections and § 112, second paragraph, rejections. Accordingly, those amendments are believed to place the present application in better condition for appeal, and entry thereof is respectfully requested.

Claims 1, 2, 4 to 7, 9 to 16, 20 to 22 and 24 to 29 were rejected under 35 U.S.C. § 102(b)¹ over U.S. Patent 5,546,458 (Iwami); and claims 3, 8, 17, 18 and 23 were rejected under 35 U.S.C. § 103(a) over Iwami. Withdrawal of these rejections is respectfully requested for the following reasons.

In one aspect, exemplified by Claims 1, 4, 11 and 14, the present invention provides noise cancellation, by: (1) utilizing two circuits, the second circuit having a noise component which is approximately equal to the noise component of the first circuit, where the noise components result from noise experienced by the first and second circuits, and by (2) subtracting the output of the second circuit from the output of the first circuit. By virtue of this arrangement, the present invention often can significantly reduce noise effects. This invention has particular application in mixed signal integrated circuits, in which digital and analog circuits are combined on the same chip.

Thus, independent claim 1 is directed to a circuit which includes a first circuit, a second circuit and a subtractor circuit. The first circuit has a first input and a first output, which includes a function of a signal at the first input and also includes a first noise component resulting from noise experienced by the first circuit. The second circuit, is located proximal to the first circuit and has a second input and a second output, the second output including a function of a signal at the second input and also

¹It is again assumed that the examiner intended to reject these claims under § 102(e), as noted in the previous Amendment.

including a second noise component resulting from noise experienced by the second circuit. It is a feature of this aspect of the invention that the second noise component is approximately equal to the first noise component. The subtractor circuit is connected to the first circuit and to the second circuit and subtracts the second output from the first output.

Independent claim 4 is directed to a circuit that includes first, second and third circuits. The first circuit has a first input and a first output, the first output including a function of a signal at the first input and also including a first noise component resulting from noise experienced by the first circuit. The second circuit has a second input and a second output, the second output including an input signal component which is a function of a signal at the second input and also including a second noise component resulting from noise experienced by the second circuit, the input signal component being a null output, and the second noise component being approximately equal to the first noise component. The third circuit has a third input connected to the first output and a fourth input connected to the second output to subtract the second output from the first output.

Independent claim 11 is directed to an integrated circuit chip (IC) that includes a plurality of analog circuits, each proximal to each other, and each of the plurality of analog circuits producing an output signal which includes a function of an input signal and also includes a noise component resulting from noise experienced by the plurality

of analog circuits. A noise separator circuit, proximal to the plurality of analog circuits, produces a noise signal based on noise experienced by the noise separator circuit, the noise signal being approximately equal to the noise component of the output signal output by each of the plurality of analog circuits. A noise canceling circuit processes the output signals with the noise signal to reduce the noise component of the output signal output by each of the plurality of analog circuits.

Independent claim 14 is directed to a noise cancellation method. According to this method, a first signal is supplied to a first circuit, and a first output is read from the first circuit. A signal is supplied to a second circuit which results in a null output from the second circuit, the second circuit being located proximal to the first circuit, and a second output is read from the second circuit. The first output is then combined with the second output to produce a combinational output, the noise component of the first output due to noise experienced by the first circuit being approximately equal to the noise component of the second circuit due to noise experienced by the second circuit.

The foregoing combinations of features are not understood to be disclosed or suggested by the applied art. For instance, Iwami is not seen to disclose or to suggest at least the feature of subtracting the output of a second circuit from the output of the first circuit, where a noise signal resulting from noise experienced by the second circuit is approximately equal to the noise signal resulting from noise experienced by the first circuit.

In this regard, Iwami is directed to a hands-free communication apparatus for combining inputs from two or more different microphones. In an attempt to simultaneously reduce noise, Iwami subtracts the input of one microphone from the input of another microphone, rather than adding the inputs from the two different microphones. Thus, Iwami is different from the present invention because Iwami focuses solely on input noise, not noise experienced by two different circuits.

As a result, Iwami says nothing at all about noise components resulting from noise experienced by a circuit, much less about such a noise component from a second circuit being approximately equal to a noise component from a first circuit. This difference is believed to be significant because, for example, the techniques for insuring that input noise signals are the same (as in Iwami) generally will be different than techniques to insure that two circuits experience the same noise (as in the present invention).

In response to these points, it was asserted in the Office Action that Iwami's amplifiers 38 and 40 are identical (although Applicant notes that nothing in Iwami is seen to indicate that this is the case), and that they would therefore generate the same internal noise. This comment is believed inapplicable to the present invention for the following reasons. First, it is noted that internally generated noise, such as thermal noise, is significantly different than noise experienced by a circuit, such as electromagnetic environmental noise (see, e.g., claims 21, 26, 28 and 29). Second,

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internally generated noise is likely to be random and uncorrelated between even identical circuits.

Moreover, nothing in Iwami is seen to indicate that the two amplifiers 38 and 40 would experience the same external noise. For example, amplifier 38 may be placed closer than amplifier 40 to a particularly noisy circuit. As a result, amplifier 38 would experience different noise than amplifier 40.

Thus, Iwami would not have disclosed or suggested using a second circuit that has a noise component resulting from noise experienced by the second circuit which is approximately equal to the noise component from noise experienced by a first circuit. In addition, the foregoing independent claims include other features which are not disclosed or suggested by Iwami. For instance, claim 4 recites that the input signal component of the second circuit is a null output (which is defined on page 5, lines 11 to 17 of the specification). Independent claim 11 recites a noise separator circuit that produces a noise signal approximately equal to the noise component of the output signal of each of a plurality of analog circuits. Independent claim 14 recites a feature of supplying a signal to a circuit which results in a null output from the circuit. Nowhere is Iwami seen to disclose or to suggest any of these features of the present invention.

Accordingly, independent claims 1, 4, 11 and 14 are believed to be allowable over the applied art.

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Independent claim 7 concerns a circuit in which a second circuit receives the inverse of a signal input to a first circuit, and the output of the second circuit is subtracted from the output of the first circuit. By virtue of this arrangement, significant noise reduction often can be accomplished, as described in detail in the specification.

Thus, independent claim 7 is directed to a circuit that includes a first circuit having a first input and a first output, the first output including a function of a signal at the first input and also including a noise component resulting from noise experienced by the first circuit. A second circuit has a second input and a second output. A signal supplying circuit supplies to the second input a signal an inverse of the signal at the first input. A third circuit has a third input connected to the first output and a fourth input connected to the second output, and subtracts the second output from the first output.

Iwami is not understood to disclose or to suggest the foregoing combination of features. In particular, Iwami is not understood to disclose or to suggest at least the feature of supplying a signal to a second circuit which is the inverse of the signal applied to a first circuit, and then subtracting the output of the second circuit from the output of the first circuit. Despite the fact that this point was raised in the previous Amendment, the present Office Action still fails to even assert that Iwami discloses or suggests this feature of the invention.

Accordingly, independent claim 7 is believed to be allowable over the applied art.

The other claims in this application depend from the independent claims discussed above, and therefore are believed to be allowable for at least the same

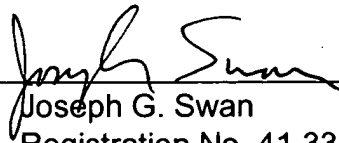
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reasons. Because each dependent claim also defines an additional aspect of the invention, however, the individual reconsideration of each on its own merits is respectfully requested. For instance, dependent claims 21, 26, 28 and 29 recite that the experienced noise is environmental electromagnetic noise. Also, dependent claims 6 and 10 recite that the various circuits are on a single integrated circuit chip. Nowhere is Iwami seen to disclose or to suggest these features of the present invention.

In view of the foregoing remarks, it is believed that the entire application is in condition for allowance, and such action is respectfully requested at the Examiner's earliest convenience.

Respectfully submitted,
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